IRIDIUM

The atoms of iridium, like platinum, are in *face-centered cubic* arrangement.

The side of the elementary cube is 3.80 Å., and the distance from one atom to each of its twelve nearest neighbors 2.69 Å.

ALBERT W. HULL

SCHENECTADY

EFFECTS PRODUCED BY X-RAY ENERGY ACTING UPON FROGS' OVA IN EARLY DEVELOPMENTAL STAGES

SEVERAL interesting and possibly significant facts were ascertained, in connection with the general study of the action of X-ray energy upon the fertilized frogs' ovum, through raying the entire egg at different developmental stages up to the time of closure of the neural tube. Because of the chemical and physical ontogenetic processes involving both proanlagen constituents, enzyme and nutritive, and immediately anticipating the morphologic features of differentiation, it was supposed that these substances must show a variable degree of absorption of energy dependent upon the stage of development. When the quantity of energy utilized remained constant, the defects produced should vary with the stage rayed. One might anticipate both gross and microscopic morphologic variations in the developed embryos. The results of this experiment, however, are precisely of the reverse nature.

The eggs were permitted to develop in the ponds where they were laid until the proper stage of development had been reached, whereupon they were brought immediately into the laboratory and rayed. Development was permitted to progress in glass jars of a capacity of 1,000 c.c., the water being changed frequently. Of the 300 eggs used for the experiment, upwards of fifty were sectioned serially. The embryos were fixed in formalin after Schultze's method at varying intervals after raying. None, however, was permitted to develop to the time of metamorphosis. In all of the experiments the distance from the target to the eggs and the per-second energy output of the tube were constant as was also the time of exposure. The tube carried a current strength of 50 milliamperes at 50 K.V. A dosage of 100 mam. was given to each group of from twenty to twenty-five eggs. These were placed 17.5 cm. from the target. The different groups represented approximately every developmental stage from the two-cell to the period of the closure of the neural tube. No attempt was made to orient the eggs with reference to the tube so that the animal pole or the vegetable pole or right side or left side of the embryos should be uppermost.

Contrary to what one might at first anticipate, the developed embryos were identical in every gross and microscopic detail to those produced by raying the whole ovum at the two-cell stage as described by the author in the *Anatomical Record* of November, 1919. This uniformity of results, irrespective of the stage rayed, is the most striking feature of the experiment. Sections of these embryos resemble in every histological detail those produced by the former method, and could serve very well to illustrate the results of that investigation. Since the author has already given these details, it would be superfluous to duplicate that description in this paper. The experiment represents, therefore, still another method by means of which a standardized, defective, morphologic condition may be produced.

Owing chiefly to our present lack of knowledge of the association of chemical formula with morphologic structure in the ovum, a completely satisfactory explanation of this phenomenon can not be given. Before such may be attempted, prolonged experimentation along this line must necessarily be carried out. This represents merely one step in the experimental analysis of the ovum and whatever conclusions are drawn from the phenomenon produced must be based very largely upon hypothesis.

The factors concerned fall into two natural categories, one embryological and the other chemical or physical, *i. e.*, one dealing with the embryological mechanism affected, and the other with the nature of the change produced in the physical and chemical constitution of the ovum. Granting the presence of a series of chemical ontogenetic modifications preceding

the known morphologic features of cell differentiation, it is not impossible that one and the same molecule whether falling in the category of proanlagen nutritive or enzymatic substance might, regardless of the oxidative or reductive changes incident to its elaboration, show the same capacity of absorption of energy in the two-cell stage as in the gastrula no neural-plate stages. A constant and uniform alteration of this molecule might be assumed to lead to a correspondingly constant and uniform embryological result. To the mind of the author, however, this assumption appears less probable than the hypothesis that certain protoplasmic substances maintain a constant structure, both physical and chemical, during the early stages of ontogeny. It argues equally well for the results produced whether we determine the nature of this constant content to be nutritive or enzyme, since it is conceivable that the deprivation of the enzymes of the substances out of which the morphological structures of differentiation are formed would lead to the same developmental result as the inhibitive effect of energy acting upon the ferments themselves. The presence of retardation effects is well attested both by this and by the earlier experiment and might well be accounted for on these grounds.

It is significant that in these specimens there is an absence of evidence pointing towards the destruction either of protoplasmic or of nuclear material. A more severe degree of injury brought about by the use of a greater amount of energy was evident through the presence of both protoplasmic and nuclear detritus. Furthermore, it must be pointed out that the change brought about is not incompatible with the vitality of the cells. There appears to have been suspended apparently the function of but one physiological factor of cell development, that of differentiation, unattended by any morphologic indication of destruction. The precise nature and location of this alteration, if morphologic, can not at present be identified.

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THE AMERICAN CHEMICAL SOCIETY.

V

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

H. D. Batchelor, *chairman*

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The symposium on cellulose chemistry attracted considerable attention and it was voted to hold a second symposium at the time of the autumn meeting in Chicago. The purpose of these symposia is to determine whether the formation of a section of Cellulose Chemistry within the society is feasible, some seventy-five members having expressed themselves in favor of such a project in discussing the matter by correspondence. The question of specifications for reagent chemicals and the standardization of laboratory apparatus and instruments brought out a number of valuable contributions, both from manufacturers and consumers, indicating willingness on the part of all concerned to cooperate in bringing about the standardization which is recognized as necessary. The subject of stimulating research in pure and applied chemistry and devising an incentive to such research gave rise to a lengthy discussion in which the economic status of the chemist was brought in. The present situation with reference to professors and instructors was discussed at length, involving the conditions for research in the various institutions and what might be done toward improving circumstances. The result of Dr. Comey's investigation would seem to indicate that at present the chemist is being as well paid for his services on the average as are the members of any of the other professions and that those in responsible positions in industry have shown a remarkable advance in earning power during the last few years. At the September meeting a symposium on the conservation and utilization of fuel will be held in addition to the symposium on cellulose chemistry and general papers.

Mechanism of the reactions of cellulose: Jessie E. Minor. The charge upon the cellulose is the result of the selective adsorption of the ions of an electrolyte by means of the residual valence which certain atoms or groups of atoms upon the surface of the colloid are capable of exerting. The subsequent swelling of a colloid in the presence of acids and bases is due to the absorption of water by the colloid as a result of a dialyzing or a repulsive force associated with the presence of the electrolyte ion. The hydration of cellulose is due